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COLEOPTERA LARVAE



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INTRODUCTION

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The "KEY TO THE COLEOPTERA LARVAE LIKELY TO BE TAKEN AT PLANT QUARANTINE," that follows has been prepared under the direction of Dr. W. H. Andersen, Asst. Chief of the Insect Identification and Parasite Introduction Section of the Entomology Research Branch of the U. S. Department of Agriculture. Dr. Anderson is a specialist in the identification of Coleoptera larvae; hence a key to this group prepared by him and tailored to the needs of Plant Quarantine Inspectors, will be of inestimable value to the inspector. It will permit him to recognize, within the limits provided by the key, most of the Coleoptera larvae taken at Plant Quarantine.

Once the Inspector has learned the key, he should, after some on the job training, be able to recognize with the aid of a hand lens most of the forms treated under Section "A" of the key- the so called "Stored Products" beetle larvae. Though many of these forms are economically important, they have world-wide distribution; hence are of no plant quarantine significance. The Inspector should, however, make a careful appraisal of the pest potential of all Bruchidae and Curculionidae larvae found in seed. Since there are quite a few beetle larvae associated with "Stored Products," being able quickly to recognize most larvae in this category will conserve the Inspector's time for more important inspections.

Further application of the key will also permit the Inspector to make a reasonable appraisal of the pest potential of any coleopterous larva taken from any plant quarantine situation. To do this, however, the worker must keep four points in mind: 1- he must know the exact host from which the insect is taken; 2- he must know where the host material originated; 3- he must note the exact situation the pest is working and the type of damage done, i.e., does it feed on the internal or the external portion of its host, is it doing primary damage, and is there anything characteristic about its feeding habits; 4- he must be able to identify the insect at least to the order and family. For example, assume the host to be potato tubers from Mexico. The insect is a coleopterous larva which makes rather large clean tunnels within the tuber, and which the key identifies as a Curculionidae. The well informed Inspector will know or will soon learn by consulting his "Host-Pest" file that potatoes from Mexico are often infested with a curculionid larva, Epicaerus cornatus, that makes large clean tunnels in the tuber.

With this evidence at hand it is not unreasonable to assume the larva at hand is E. cognatus, an insect not found in Indonesia. Since there is no substitute for a positive identification, the specimen should be sent to an expert for identification with a request it be returned to be added to the collection. It will then be available for comparison when future interceptions are made.

Nothing can be more useful to Plant Quarantine inspections than a large, well organized collection of insects likely to be taken at quarantine. Nothing will add more to the usefulness of a plant quarantine inspector than a continuous, careful, intelligent study of such a collection. At this point it should be emphasized the station collection should contain only those insect forms that are likely to be encountered during plant quarantine inspections. The interested worker will collect and study other insect forms so that he may understand their systematic relation to those he finds in his work. To add these to the station collection, however, would only make it unwieldy, hence less useful.

It is just as important, perhaps more so, for the inspector to have adequate reference literature as it is for him to have adequate insect material for study. Alvah Peterson's "Larvae of Insects" and Boving and Craighead's "Illustrated Synopsis of the Principal Larval Forms of the Order of Coleoptera" are two standard references on immature Coleoptera. It will be noted from the credits given that most of the illustrations used in the key are from these publications. Because of the accompanying text dealing with the description and habits of the orders, families, and forms featured, Alvah Peterson's books will be found especially useful to the worker making his first serious effort to understand and apply the taxonomy of coleopterous larvae. Besides these books, each Port of Entry will be furnished a collection of bulletins and other literature on specific coleopterous larva and larval groups. A thorough working familiarity with the available literature may be of immeasurable help to the inspector when he is hard put to make a difficult appraisal of the pest potential of the material at hand.

- A-Larvae in "stored products", i.e., grain, dry seed and nuts, ground-up vegetable products, tobacco..... B
- B-Legs six-jointed, the tarsus and claw (or claws) counted as separate joints; see fig. B..... Carabidae

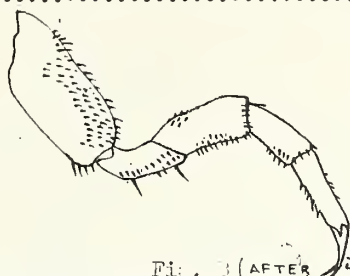


Fig. B (AFTER ALVAH PETERSON.)

- BB-Legs five-jointed, tarsus and claw fused and counted as one joint; or less than five joints or absent; see Fig BB..... C

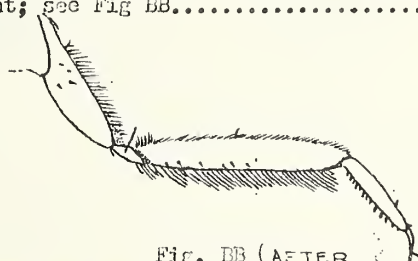


Fig. BB (AFTER ALVAH PETERSON.)

- C-Larva C-shaped or obviously curved, often without legs..... D

- D-Legs present and distinct..... E

- E-Body with numerous soft hairs, hairs long..... F

- F-Head capsule with color pattern as figured in F-1; thoracic spiracle in normal position; see Fig. F-2..... Anobiidae
(Lasioderma)



Fig. F-1 (AFTER ALVAH PETERSON)

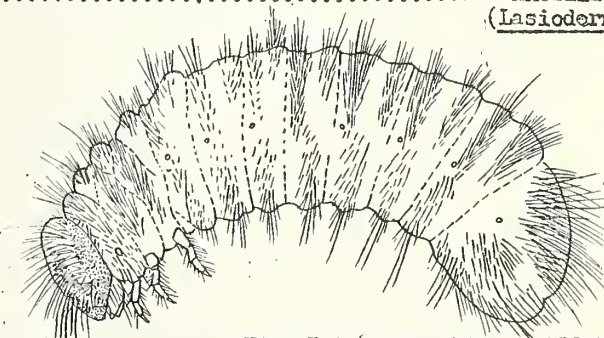
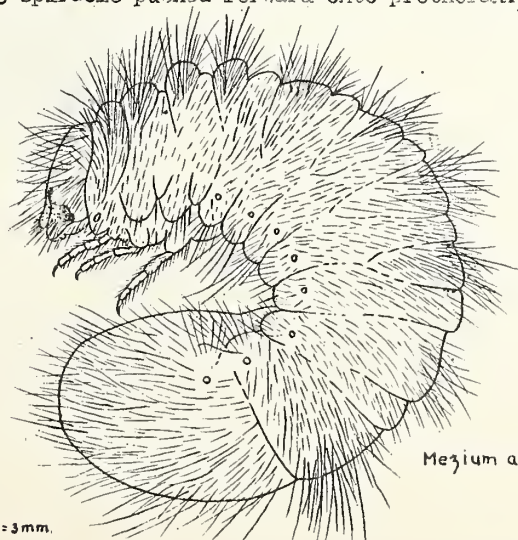


Fig. F-2 (AFTER ALVAH PETERSON)

- FF-Head capsule not with the above pattern, with a broad, anterior pigmented band; thoracic spiracle pushed forward onto prothorax. Fig. FF..... Ptinidae



Mezium americanum

L=3mm.

FIG. FF (AFTER ALVAH PETERSON.)

EE- Body with, at most, short hair, or hook-shaped asperites in patches on the upper surface..... G

G-Head free; spiracles not simple (i.e., with spout-like prolongation); body with hook-shaped asperites on dorsum, see Fig. G..... Anobiidae
(Stogobiina)

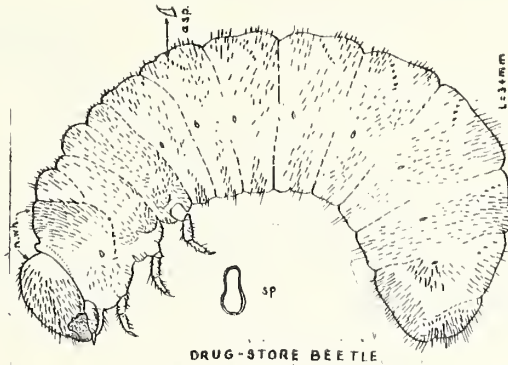


Fig. G (AFTER ALVAH PETERSON)

GG-Head retracted; spiracles simple, circular or oval; body without asperites. see Fig. GG..... Bostrichidae

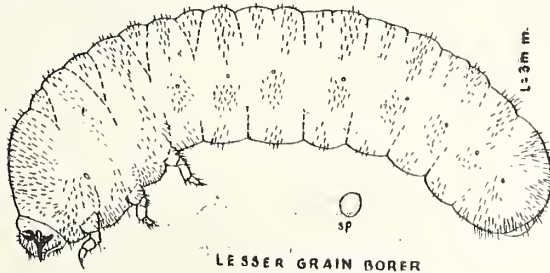


Fig. GG (AFTER ALVAH PETERSON)

DD-Legs absent or very small..... H

H-Labial palpi absent; larvae always in seeds or nuts, See Fig. H.. Bruchidae

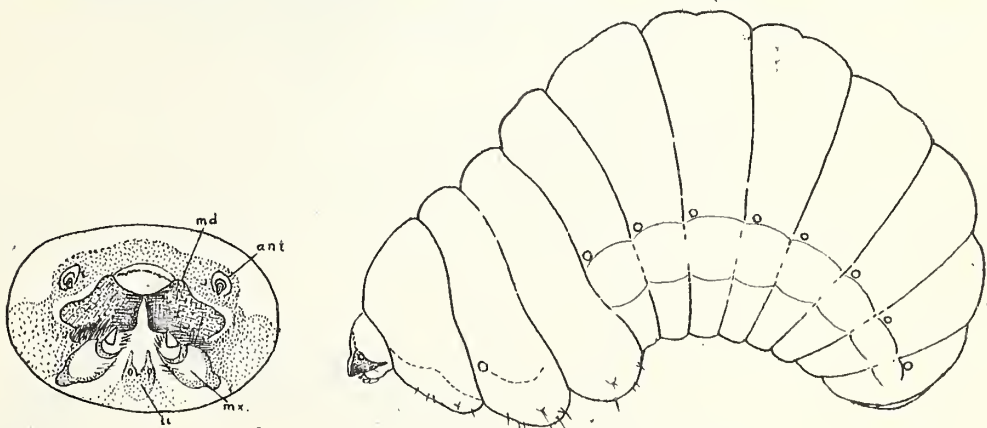


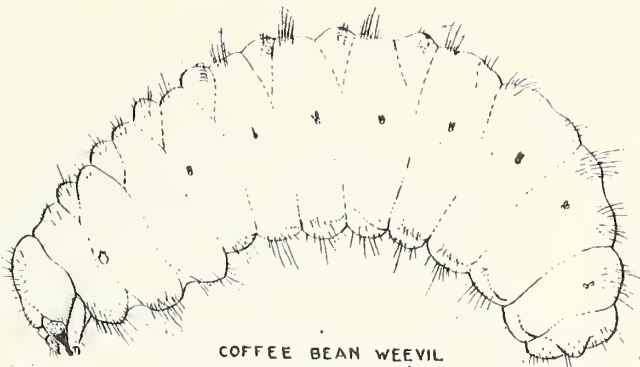
Fig. H (AFTER ALVAH PETERSON)

HH-Labial palpi present, distinct, larvae may be in seed or not..... I

I-Body with moderately distinct, numerous hairs; abdominal segments with transverse rows of short longitudinal, membranous ridges, see Fig. I next page. Anthrribidae
(Araecerus)



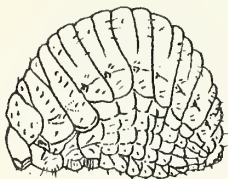
COFFEE BEAN WEEVIL



COFFEE BEAN WEEVIL

Fig. I (AFTER ALVAH PETERSON)

II-Body with very few, indistinct hairs; abdominal segments without transverse rows of longitudinal plicae, see Fig II..... Curculionidae
(*Sitophilus* and *Curculio*)



Sitophilus linearis.



Curculio proboscideus

Fig. II (AFTER RICHARD T. COTTON)

CC-larvae straight or nearly so, with well-developed legs.....

J

J-Body whitish, with evident pink or lavender areas; (spiracles large, bifurcated); larvae in copra, see fig. J.....

Corynetidae
(*Necrobis*)

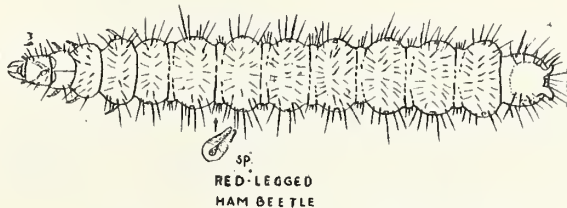


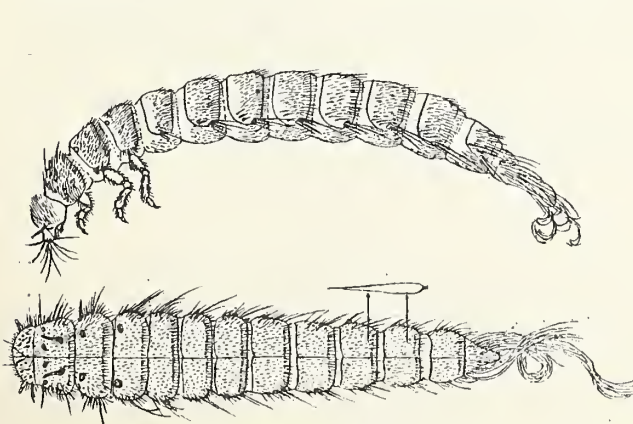
Fig. J (AFTER ALVAH PETERSON)

JJ-Body without evident contrasting white and colored areas.....

K

K-Setae on body long, numerous and barbed, hastate or flattened, see Fig. K.....

Dermestidae



Allagenus piceus

(AFTER ALVAH PETERSON.)

Fig. K



Trogoderma ornata



Novelsis horni.

(AFTER BRYANT E. REES.)

- KK-Setae present or absent, if present not as described above..... L
- L-Urogomphi present or absent, but if present then jointed and movable. M
- M-Urogomphi present, see Fig. M..... Staphylinidae

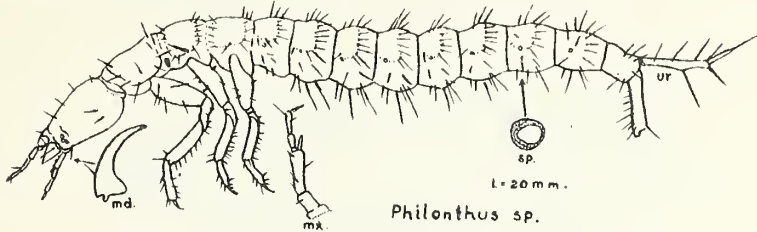


Fig. M (AFTER ALVAH PETERSON.)

- MM-Urogomphi absent, Fig. MM.....

Cucujidae
(Oryzaephilus)

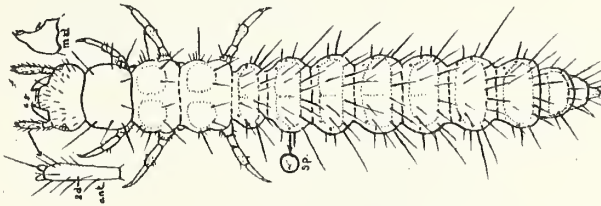


Fig. MM (AFTER ALVAH PETERSON.)

- LL-Urogomphi present and immovable (not jointed).....

N

- N-Larva sclerotized dorsally, without extensive membranous areas, body often hard and shiny, see Fig. N.....

Tenebrionidae

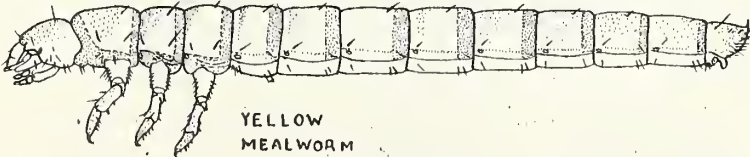
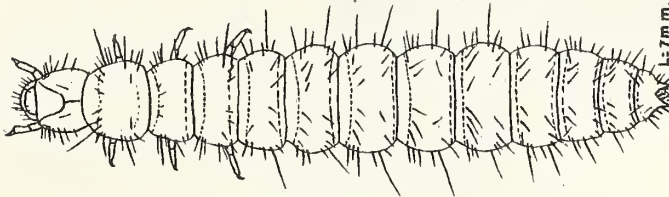
YELLOW
MEALWORMCONFUSED
FLOUR BEETLE

Fig. N (AFTER ALVAH PETERSON.)

- NN-Larva with extensive membranous areas in which there may be sclerites; body not hard and shiny.....

O

- O-With abdominal segment VIII distinctly longer than VII; abdominal segment IX consisting entirely of urogomphi, the base of urogomphi articulated to apex of seg. VIII, see Fig. O. Cucujidae

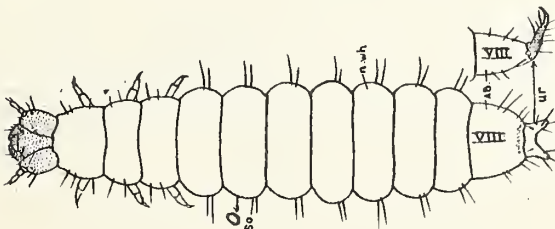
(Leomophloeus)

Fig. O (AFTER ALVAH PETERSON.)

00-With segment VIII not longer than VII; urogomphi forming only part of segment IX and not articulated to apex of segment VIII.

P

P-With obviously pigmented sclerotized plates on thoracic segments, both dorsally and ventrally; urogomphi arising from distinctly heavily sclerotized, basal plate, see Fig. P.....

Ostomidae
(Tenebrionides)

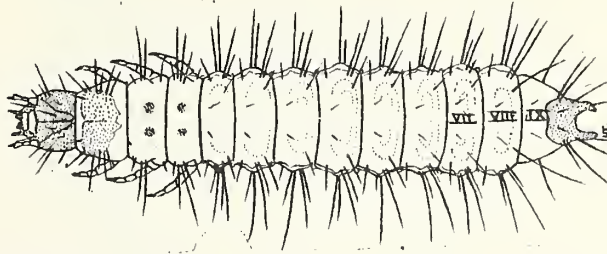


Fig. P (AFTER ALVAN PETERSON)

PP-Thoracic segments without plates; urogomphi not arising from distinct basal plate.....

Q

Q-Maxillary mala falciform (curved like a sickle), See Fig. Q. Cryptophagidae

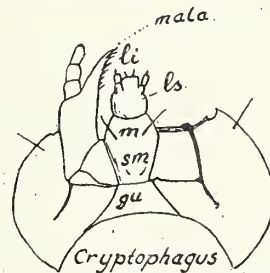


Fig. Q (AFTER BOVING & CRAIGHEAD)

QQ-Maxillary mala obtuse; urogomphi with beaded longitudinal ridges at base, see Fig. QQ..... Mycetophagidae
(Typhaea and Mycetophagus)

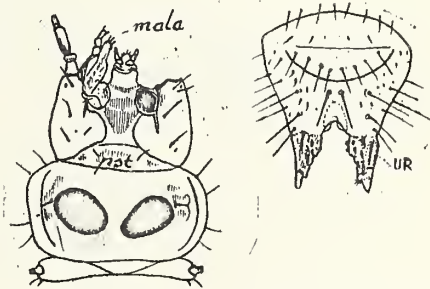


Fig. QQ (AFTER BOVING & CRAIGHEAD)

AA-Larvae in or on unprocessed plant material or boring in wood or woody tissue, or in soil.....

B

B-Legs six-jointed, the tarsus and claw (or claws) counted as separate joints, See Fig B under section A

Carabidae

BB-Legs five-jointed, the tarsus and claw fused and counted as one joint, or legs less than five joints or absent, see Fig. BB under section A.....

C

C-Larva C-shaped, obviously curved (if not obviously curved, then without legs)

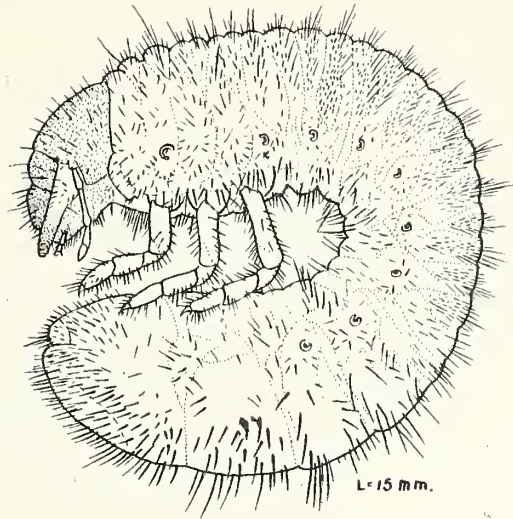
D

D-Legs present and distinct.....

E

E-Spiracles crescent-shaped; larvae free-living, see Fig E..... Scarabaeidae

E-Cont.



JAPANESE BEETLE

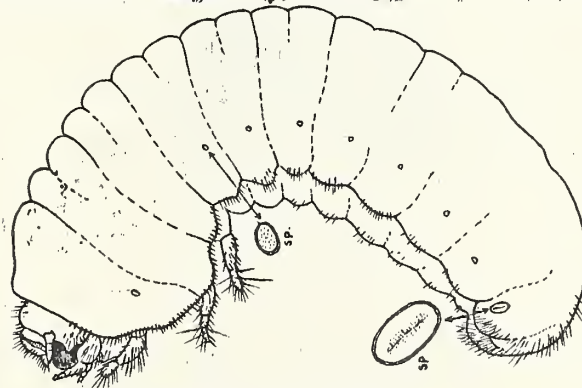
Fig. E (AFTER ALVAH PETERSON.)

EE-Spiracles not crescent-shaped; larvae feeding internally:.....

F

F-Eight abdominal spiracle about three-times as large as those on anterior abdominal segments, see Fig. F.....

Lyctidae



SOUTHERN LYCTUS BEETLE

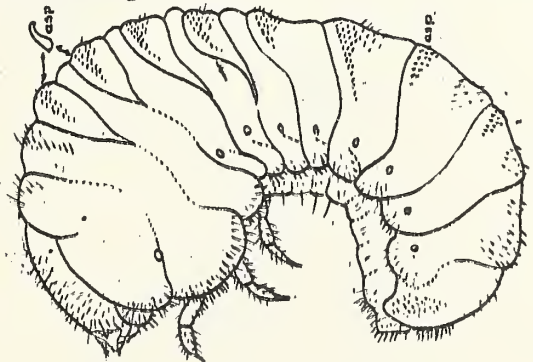
Fig. F (AFTER ALVAH PETERSON.)

FF-Eight abdominal spiracle subequal in size to those on anterior abdominal segments.....

G

G-Head free, see Fig. G.....

Anobiidae



DRY WOOD BEETLE

Hdrobregmus carinalus.

Fig. G. (AFTER ALVAH PETERSON.)

GG-Hoad retracted, See Fig. GG.....

Bostrichidae

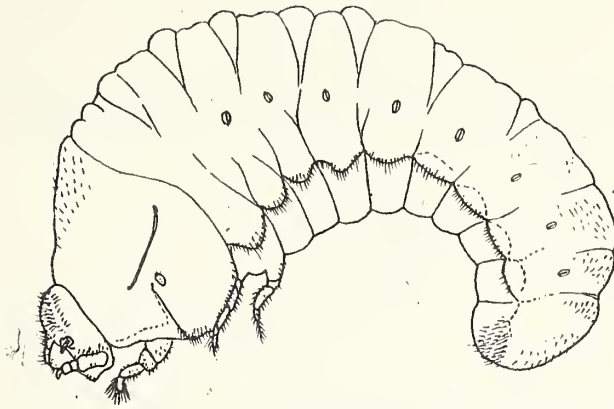


Fig. GG (AFTER ALVAH PETERSON)

DD-Legs absent or very small.....

H

H-Body with moderately distinct, fine, numerous hairs; larvae living internally, See Fig. I under Section A for *Araecerus*. (Boving and Craighead add "Legs present, one-, two-, or three-jointed, always without a claw-shaped tarsomalar joint"- sub-family *Brachytarsinae*.) See Fig. H.

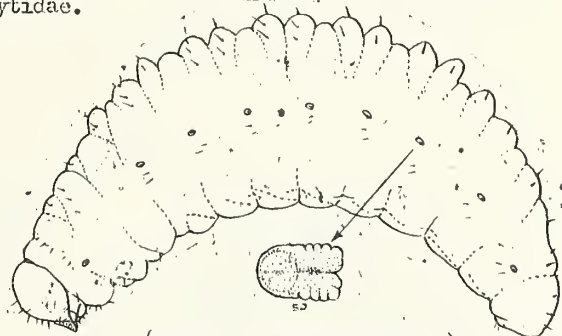
Anthribidae



Fig. H (AFTER BOVING & CRAIGHEAD.)

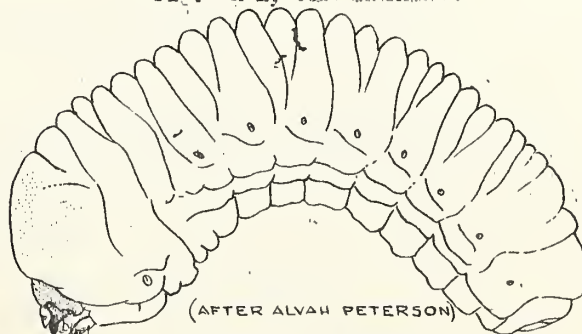
HH-Body almost always with very few, indistinct hairs; larvae may feed internally or externally, see Fig. HH-1, Curculionidae; Fig. HH-2, Scolytidae.

Curculionidae & Scolytidae



(AFTER ALVAH PETERSON.)

Fig. HH-1, Curculionidae



(AFTER ALVAH PETERSON.)

Fig. HH-2, Scolytidae

- OO-Larva straight or nearly so (if slightly curved then legs are present) I
- I-Larvae feeding internally, usually in solid wood; legs often reduced in size and often non-functional, or legs may be absent..... J
- J-Larvae feeding internally; prothorax dorso-ventrally flattened and with dorsal and ventral orange or brownish plates; legs absent; spiracles crescent-shaped, See Fig. J..... Buprestidae

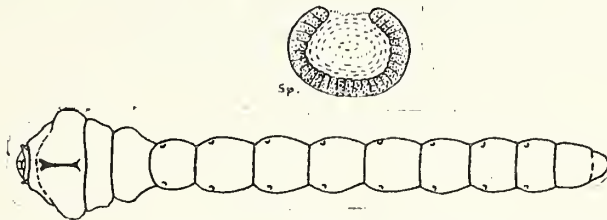


Fig. J (AFTER ALVAH PETERSON.)

- JJ-Larva with prothorax not obviously flattened; legs present or apparently absent; spiracles not crescent-shaped..... K

- K-Gula absent, see Fig. K..... Mordellidae

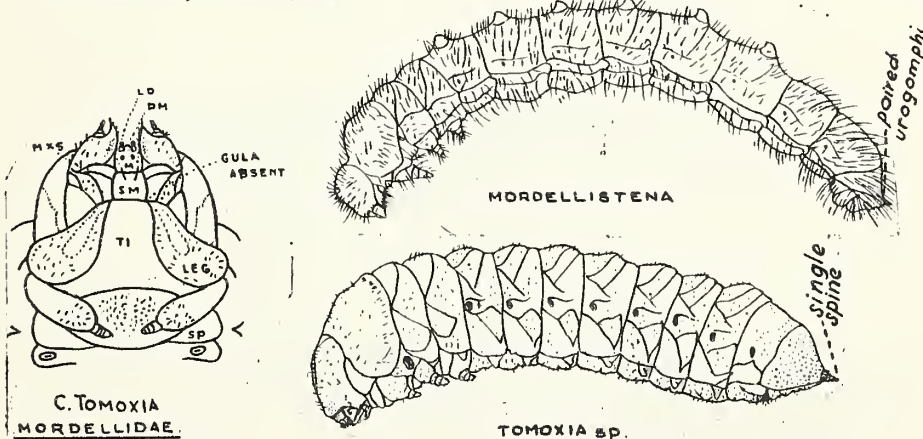
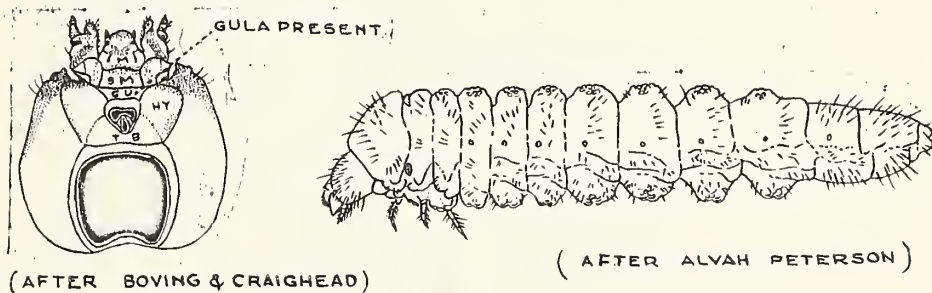


Fig. K (AFTER BOVING & CRAIGHEAD)

- KK-Gula present, see Fig. KK..... Cerambycidae



(AFTER BOVING & CRAIGHEAD)

(AFTER ALVAH PETERSON)

Fig. KK

- II-Larvae usually not feeding internally, if internal not in solid wood; legs distinct and functional (except leaf-mining larvae)..... L
- L-Urogomphi present and jointed..... M
- M- Spiracles annular..... Staphylinidae

MM-Spiracles biforous; see Fig. MM. (Larvae attack crucifers, beans etc.)..... Hydrophilidae
(Helophorus)



Fig. MM (AFTER BOYING & CRAIGHEAD)

LL-Urogomphi absebt or present, if present they are hard and not jointed. N

N-Labrum absent, nasale present, see Fig. N..... Elateridae

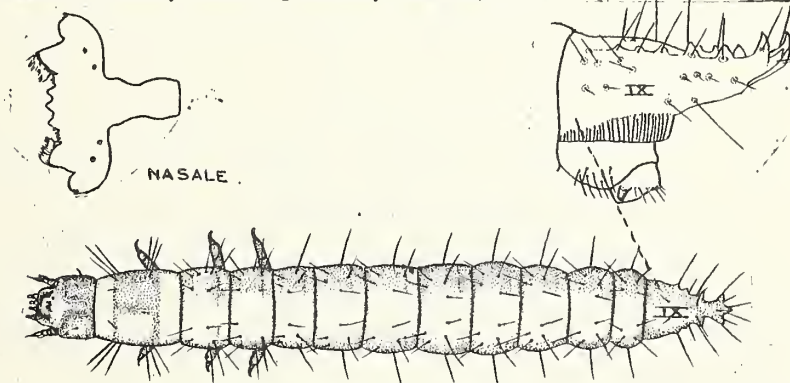


Fig. N (AFTER BOYING & CRAIGHEAD)

NH-Labrum present..... 0

O-Urogomphi almost always present and usually with accessory projections, See Fig. O; larvae often in dried or decaying fruit,. Nitidulidae

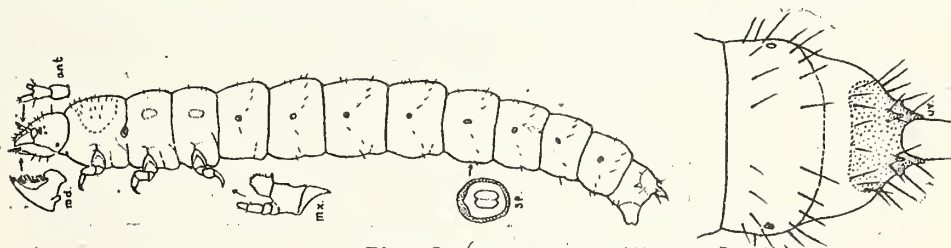


Fig. O (AFTER ALVAH PETERSON.)

OO-Urogomphi almostalways absent, if present rather simple; larvae not in dried or decaying fruit..... P

P-Larvae predaceous for the most part, feeding on small insects; occasionally phytophagus (Epilachna) but then with long, dorsal scoli, see F ig. P..... Coccinellidae

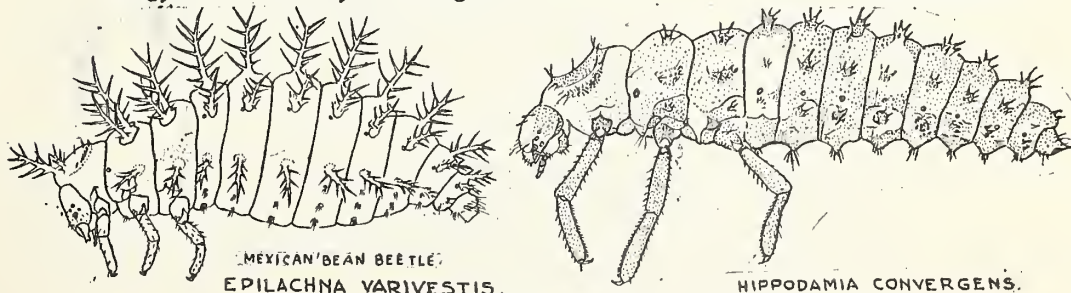
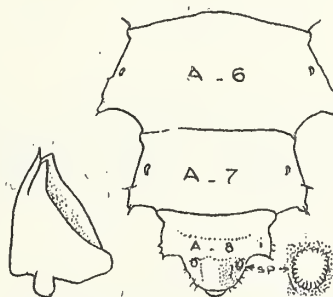


Fig. P (AFTER ALVAH PETERSON.)

PP-Larvae not predaceous, always or nearly always phytophagus; if with alongate processes, they are lateral and not dorsal..Chrysomelidae

The characters used in the following "Key to the Subfamilies of Chrysomelidae Larvae Likely to be Encountered at Plant Quarantine" are an adaptation of those used by Alvah Peterson in his "Larvae of Insects" and in Boving and Craighead's "Illustrated Synopsis of the Principal Larval Forms of the Order of Coleoptera."

- A- Larvae without thoracic legs (leaf miners)B
- B- Larva with nine or ten abdominal segments; mandibles gouge-shapedOrsodacinae
- BB- Larva with eight abdominal segments; mandibles with three or more teeth; spiracles on eighth (caudal) segment on dorsal aspect; body distinctly wedge-shaped. See Fig. BB. (See also Fig. E below.) . . .Hispinae (in part)



md. Fig. BB (AFTER BOVING & CRAIGHEAD) (AFTER ALVAH PETERSON)

- AA- Larvae with thoracic legs; not aquatic; labrum distinct, not fused with clypeus. (If labrum otherwise, see Boving and Craighead's key of Chrysomeloidea.) See Fig. C belowC
- C- Mandibles usually not palmate (not hand-shaped) and with one or two (occasionally three) teeth on distal margin; epicranial suture long; ocelli absent; body white and curved; claws (tarsunguli) long and slender; numerous long and stiff setae or lobes present on the ventral aspect of most abdominal segments. (With few exceptions the larvae are root feeders.) See Fig. C.Eumolpinae

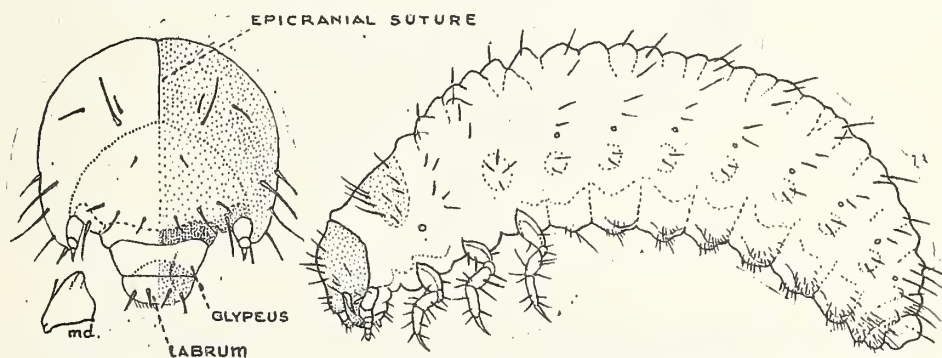


Fig. C (AFTER ALVAH PETERSON)

- CC- Mandibles usually palmate (more or less hand-shaped-- see Figs. F 1 and GG) with four or five (occasionally three) teeth on distal margin; if not palmate abdomen possesses eight segments and there are bifurcate (forked, partly divided) pulvilli below each claw (see Fig. E below); ocelli usually presentD
- D- Maxillary palpus two-jointed or less (see Fig. E below); spiracles on eighth abdominal segment either present, but dorsally placed, or absent; eighth abdominal segment terminal with free hind margin.E

- E- Spiracles on eighth abdominal segment on dorsal aspect; legs far apart arising from the lateral aspect of each segment; bifurcate pulvilli ventrad of each claw. See Fig. E. Hispinæ (in part)

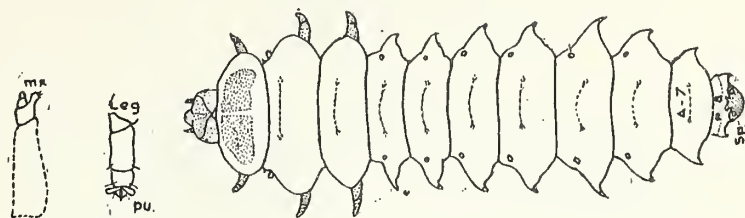


Fig. E (AFTER ALVAH PETERSON.)

- EE- Spiracles on eighth abdominal segment vestigial; tergum of eighth abdominal segment often provided with an upright fork bearing the cast skins or excrement of the larva. (Leaf feeders; feed especially on wild Solonaceae and Convolvulaceae, including sweet potatoes.) See Fig. EE Cassidinae

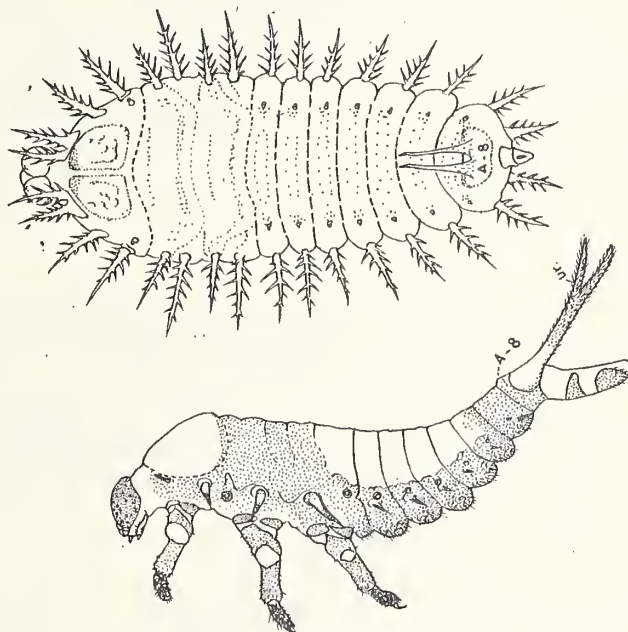


Fig. EE (AFTER ALVAH PETERSON.)

- DD- Maxillary palpus with three or more joints (see Fig. DD below); spiracles on eighth abdominal segment present and laterally placed; eighth abdominal segment not terminal, its hind margin connected with the front margin of the ninth abdominal segment. See Figs. F 1 and F 2 F



Fig. DD (AFTER ALVAH PETERSON.)

- F- Antennae two-segmented or less; one or no ocelli present on each side of head. See figures below (F 1, Galerucinae; and F 2, Halticinae). (Larvae of both subfamilies vary in feeding habits. Many species are leaf feeders, others feed on roots, and a few are leaf miners. It is difficult to separate larvae of these subfamilies.) Galerucinae and Halticinae

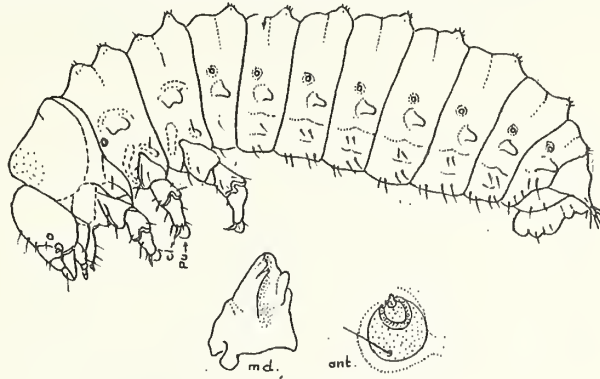


Fig. F 1

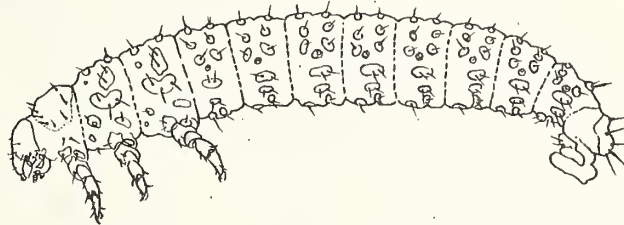


Fig. F 2

- FF- Antennae three-segmented, if less than three, labial palpi are one-segmented; more than one ocellus on each side of head, usually five or six. G
- G- Labial palpus one-segmented; ambulatorial swellings present on ventral aspect of abdominal segments; anal opening dorsal; body slimy or covered with faeces. (Leaf feeders.) See Fig. G Criocerinae

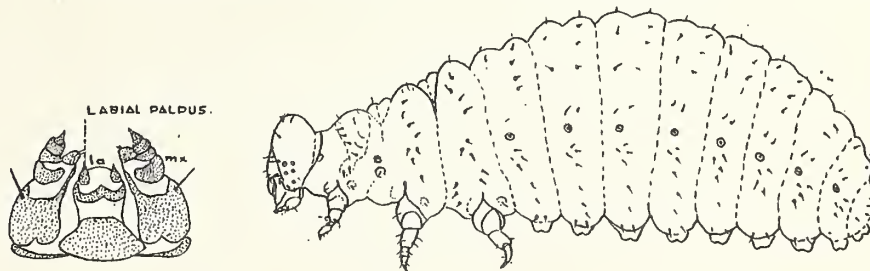


Fig. G

GG- Labial palpus two-segmented; ambulatorial swellings absent on abdominal segment; anal opening ventral and usually in center of sucking disk on tenth abdominal segment. (Most larvae are leaf feeders. These have a wide range of host plants. Some species are found feeding in and on roots. A few produce galls. Many hosts of the larvae of this subfamily are economically important.) See Fig. GGChrysomelinae

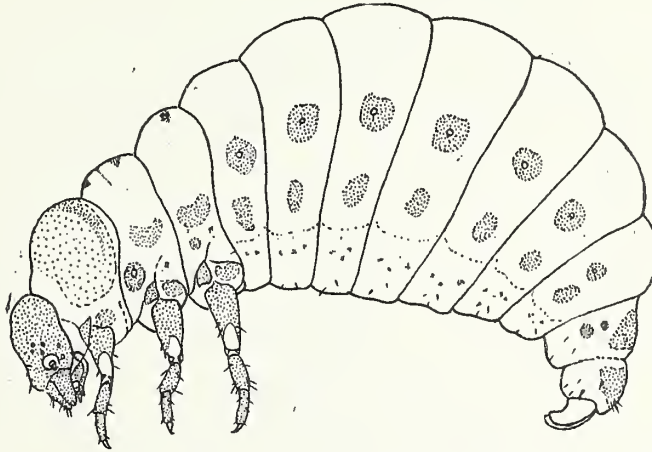


Fig. GG

